

NHEERL Fact Sheet

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An epidemiologic health study of manganese (Mn) exposure in East Liverpool, Ohio

Impact Statement: This study will address research questions under Sustainable and Healthy Communities (under Theme 2, Project 11 Additional Technical Support to Program Offices and Regions) and Air, Climate, and Energy Research Programs (under Regional Technical Support). This Regional Applied Research Effort project is a joint effort between Region 5 and ORD Scientists that will examine neurotoxic effects of Mn within three communities, high level air exposure community, mid to low range air exposure community, and no air exposure community. This work is important in that either positive results (differences between East Liverpool and comparison communities) or negative results (little or no differences among communities) inform the issue of potential health effects of residential airborne Mn exposure, a recognized gap in Mn health effects literature. Both outcomes can also help inform the need for greater airborne Mn control. In addition, the present proposal addresses the USEPA Administrator's environmental justice priority: the poverty rate is higher in East Liverpool (25.2%) than in Marietta (16.9%), Mt. Vernon (15.6%), Ohio (7.8%) or the U.S. (9.2%). East Liverpool residents have probably been exposed to some of the highest long term outdoor air Mn concentrations in the US. Health data from this community could advance knowledge of potential effects of residential airborne Mn exposure (an issue of global, national and R5 interest) and can help evaluate the need for further pollution controls. This information would also add context to the USEPA School Air Toxics study that includes schools in both Marietta and East Liverpool.

Background:

This project is a Regional Applied Research Effort (RARE) in Region 5. Potential neurotoxicity from airborne Mn exposure has been a community and risk assessment concern for more than a decade in Region 5 (e.g. OH, MI). The RARE program funded a 2009-2010 Mn health study in Marietta OH near a large industrial emitter of airborne Mn, led by Rosemarie Bowler of San Francisco State University. Mt. Vernon OH, demographically similar to Marietta but without large industrial Mn emission sources, was used as the comparison community for Marietta. Initial Marietta-Mt. Vernon comparisons generally indicate a lack of major health effect differences between the two towns. Whether this extends to East Liverpool OH, an area of much higher (up to 50-fold) outdoor air Mn concentrations is the present research question of interest, and a central reason for extending the Marietta-Mt. Vernon study.

Study Description:

This study will evaluate whether long term (minimum 10 years) residential airborne Mn exposure can affect human health. Participants in East Liverpool will be randomly selected within a 2.5-mile radius of the exposure source (a Mn warehousing and packaging facility) and appropriate exclusion criteria will be applied. Following consent procedures, participants will be administered a battery of tests of cognitive function and motor efficiency. A brief neurological examination will be conducted using the Unified Parkinson's Disease Rating Scale (UPDRS). The Computerized Adaptive Testing System (CATSYS) will be used to assess postural sway and hand tremor. Whole blood will be analyzed for Mn, cadmium (Cd), mercury (Hg), and lead (Pb). Serum will be analyzed for ferritin and two liver enzymes. Hair samples and toenail clippings will be analyzed for Mn levels. Additionally, participants will be asked to complete questionnaires asking about their demographic information, mood, diet, occupational history, behavioral habits, and health history. Data collected from East Liverpool participants will be compared with previously collected data from the demographically similar, but less Mn-exposed town of Marietta, Ohio and the comparison town of Mount Vernon, Ohio where air Mn exposure is not of concern.

Timeline:

Projected starting date: 7/2011;
IRB status: approved 8/ /2011;

Projected closing date: 8/2014
EPA review status: pending

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